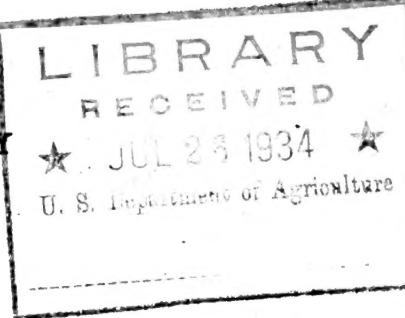


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FRUIT INSECTS

Ethylene dichloride effective against peach borer, but ineffective against lesser borer.--Oliver I. Snapp and J. B. Thomson of the U. S. Peach Insect Laboratory at Fort Valley, Ga., report poor control of the lesser peach borer (Aegeria pictipes G. & R.) from ethylene dichloride or ethylene dichloride emulsion. This is believed to be due to poor penetration of the ethylene dichloride gas into the lesser peach borer burrows on peach limbs. There was no tree injury from the treatments. Messrs. Snapp and Thomson report that the material is effective for the elimination of the major, or greater, peach borer (Aegeria exitiosa Say) from dug nursery stock, and also gives good results in controlling the major peach borer in orchard trees.

Methods of conducting experiments in control of codling moth and grape berry moth.--The field experimentation conducted this season by the Fruit Insect Division in connection with the spray residue problems, under both PWA and regular funds, will yield extensive data to be analyzed and evaluated by the divisional staff of the Washington office. With the great increase of administrative matters pressing for attention, further help has been found necessary, in order that the season's results as a whole may have the careful study they deserve. Arrangements have therefore been made for the transfer of K. W. Babcock from the corn borer laboratory at Toledo, Ohio, to the Washington office of the Fruit Insect Division. Mr. Babcock has in recent years been very successful in developing methods for measuring corn borer infestation and in the analysis of experimental data, and is well qualified to undertake this new assignment. In order to familiarize himself with the problem of controlling the codling moth (Carpocapsa pomonella L.) and the grape berry moth (Polychrosis viteana Clem.), and experiments in connection with the same, Mr. Babcock is visiting the different field stations in order to study the set-up for this season and to analyze data obtained in previous seasons. It is believed that his studies will also be of great value in the planning of future work.

Leafhopper attack predisposes grape vines to winter injury.--G. A. Runner, of the grape insect laboratory at Sandusky, Ohio, reports that the effect of injury to grape foliage caused by leafhoppers (Erythroneura comes Say) during the season of 1933 is shown in more severe winter injury to grape buds by low temperatures in February 1934. The extremely low temperatures of the past winter caused considerable injury to grape buds throughout northern Ohio, especially with the Catawba variety, which is extensively grown in the Sandusky-Lake Erie Island area. A marked contrast has been

observed in the spring condition of the buds between vineyards treated with nicotine, last season for control of leafhoppers and vineyards not so treated. The dry summer of 1933 made conditions especially favorable for leafhopper increase, heavy infestations causing burning or loss of foliage and consequent poor ripening of bearing canes. In nicotine-sprayed vineyards the leafhopper population was reduced to a point where little injury was done, the foliage remaining green and in good condition until late in the season. In these vineyards comparatively slight winter injury to the grape buds has been observed, whereas in nearby or adjoining vineyards where leafhopper injury to the foliage had been severe, more winter injury occurred, in some instances the freezing of primary buds running as high as 40 percent.

Improved facilities for work on parasites of oriental fruit moth.-- As a result of construction under a CWA allotment, completed early this spring, the oriental fruit moth project at Moorestown, N.J., now has a reconstructed insectary unit which is well adapted to the work in progress. It contains a block of rearing cages for mass production, with a maximum capacity for about 750,000 fruit moths (Grapholitha molesta Busck) with associated cages for rearing and inoculating the host, a quarantine room for rearing all foreign importations, two heated rooms for incubators and forced rearing in early spring and fall, a large cold storage chamber, a cage with humidified closet for recovery rearing, and ample and convenient storage for rearing equipment.

Insect injury to raisins.--Samples of raisins of the 1933 crop, collected during April and May from storage in open-sided sheds, were examined by Heber C. Donohoe of the Fresno, Calif., laboratory. Muscat raisins (4 samples) were damaged by feeding at the rate of from 91 to 402 pounds per ton, Thompson Seedless (5 samples) from 91 to 320 pounds per ton, and Sultana (3 samples) from 259 to 350 pounds per ton. (These figures represent injured berries per ton, not weight loss per ton.) Before drying some of the berries had been fed upon by Drosophila spp., and minor damage by the saw-toothed grain beetle (Oryzaephilus surinamensis L.) had occurred while the raisins were in storage. The major part of the feeding was by the raisin moth (Ephestia figulilella Greg.). When examined, the fruit still contained from none to 28,900 per ton of living and dead larvae, pupae, and adults of this species.

Dried fruit beetle unusually abundant.--A summary of census trapping of Carpophilus hemipterus L., by Dwight F. Barnes, of the Fresno, Calif., laboratory, shows the insect to be exceptionally plentiful this year. The comparative catches are: 1931, 21,800; 1932, 1,800; 1933, 15,000; 1934, 29,600. Infestation of figs and consequent spoilage by souring is likely to be prevalent during the ripening of the main crop in July and August.

JAPANESE AND ASIATIC BEETLES

Japanese beetle (Popillia japonica Newm.)

Final report on effect of low winter temperatures on populations of Jap beetle larvae.--Henry Fox, of the Moorestown, N.J., laboratory, presents

data bearing on this point, derived during May from three sources, the seasonal, periodic, and cooperative surveys. Those of the seasonal series of surveys are empirically summarized in the right-hand section of the table below, and data for 1932-1933 is given in the left-hand section for comparison.

Fluctuations in Japanese beetle soil populations

Period	Average population per square foot							
	1932-1933				1933-1934			
	N.J.	Pa.	General	N.J.	Pa.	General		
Sept. 1 to Nov. 30 --	8.0	15.7	11.9	6.9	9.5	8.2		
Dec. 1 to Feb. 28 --	9.2	11.6	10.4	6.5	8.3	7.4		
Mar. 1 to Apr. 30 --	8.0	12.6	10.3	5.6	7.7	6.6		
May 1 to 15 -----	8.8	14.0	11.4	6.1	7.7	6.9		
16 to 31 -----	7.4	11.2	9.3	5.9	7.6	6.8		
	:	:	:	:	:	:		

According to these figures the soil population represented in the last half of May averaged about 17 percent less than during the fall of 1933, and 27 percent less than the brood represented late in May of 1933. The reduction of 17 percent is not interpreted as indicating an unusual winter mortality. It was not greater than that found in 1932-1933.

Data on fluctuations in soil populations secured during May in connection with series of surveys show that the general average for the 10 stations examined was 9.9 larvae per square foot in the fall and 9.2 in May--a general seasonal decrease of roughly 7 percent. In the report for April 1934 it was noted that at locations visited during that month a decrease of 3 percent during the winter was found. Such reductions are usual in winters of normal temperatures. The spring surveys are now completed and the evidence bears out the opinion expressed earlier that the cold weather of the past winter has not caused any appreciable reduction in the grub population of the Japanese beetle.

A series of surveys was carried on in the fall of 1933 and another in the spring of 1934 in cooperation with the New Jersey Department of Agriculture. These were confined to the heavily infested areas in Cumberland and Salem Counties and were made largely in pastures. Here again, there is no indication of a winter reduction. The average grub count in October 1933 was 13.9 per square foot and in May 1934 it was 14.5 per square foot. The apparent increase is attributed to the greater difficulty of finding grubs as they moved downward in October.

Jap beetle larvae abundant in cultivated fields in southern New Jersey.--I. M. Hawley and T. N. Dobbins, of the Moorestown, N.J., laboratory, report on larval surveys made in fields in the heavily infested area in southern New Jersey to determine the grub abundance under a variety of crop-

ping conditions. In fields planted to tomatoes in 1933 counts ran 1.2 and 5.5 per square foot; in fields planted to wheat there were 4.5, 8.2, and 9.5 per square foot; in fields where asparagus was grown the averages were 4.9 and 8.4 per square foot; in a rhubarb field the count was 2.2 per square foot. In an old corn field there were 15.7 grubs per square foot around the old stubble, but only 4.7 per square foot between the hills. Several orchards gave counts of less than 1 per square foot, but in one cherry orchard that was entirely defoliated in 1933 there were 7.8 grubs per square foot between the trees and 8.1 under the trees. In a pasture in this same area grubs averaged 15.2 per square foot. Three cases of larval injury to strawberries have been reported in May.

Improved laboratory spraying apparatus.--W. E. Fleming, of the Moorestown, N.J., laboratory, has devised an improved apparatus for applying materials as stomach-poison insecticides to foliage. Fifteen revolving discs were mounted on a revolving circular table so that the plants placed on these discs pass through the spray from a fixed spray gun and are uniformly coated on all sides. The spray material is placed in a glass tank, equipped with a mechanical agitator, and flows by gravity to the spray gun. The spray is applied at a pressure of 25 pounds to the square inch. The apparatus can be operated rapidly and plants sprayed uniformly for insecticide tests under controlled conditions.

Status of imported parasite of Jap beetle.--J. W. Balock, of the Moorestown, N.J., laboratory, reports that apparently the extreme winter had no ill effect upon Tiphia vernalis Roh., as this species appeared at its normal season, the second week in May, and during favorable weather appeared in astonishing numbers in several of the older colonies. The record catch was 1,682 females in 3 hours' time, collected by 3 men. While all notes are not as yet assembled, it is estimated that close to 150 new colonies were placed in the field this season, thus the total number is approximately 347. T. R. Gardner, who scouted the 57 colonies placed in the field in 1932, made recoveries in 41 of these, or 72 percent. He states that some of these showed a very good build-up, as hundreds of males and females were observed.

Tiphia sp. No. 29, an imported parasite of the Jap beetle.--L. B. Parker, of the Moorestown, N.J., laboratory, reports that adults of this species began emerging from stored, foreign-reared cocoons on May 11, and that they ceased emerging on May 26. The sex ratio in the total adult emergence was practically even. Total emergence was 3,140 adults, or 63.1 percent of the total number of cocoons set up.

Asiatic beetles (Autoserica castanea Arrow and Anomala orientalis Waterh.)

Distribution and abundance of the Asiatic garden beetle in and around Philadelphia.--I. M. Hawley, of the Moorestown, N.J., laboratory, reports that in grub surveys made in the Philadelphia area to determine the abundance of the Japanese beetle, data relative to the presence of the Asiatic garden beetle (Autoserica castanea Arrow) in this area were also obtained. With the exception of Riverton, N.J., all the locations are in Pennsylvania. The data obtained are as follows:

Location	Sq. ft. of diggings	<u>A. castanea</u> grubs
		<u>Number</u>
St. Davids Golf Course	104	3
Ashbourne	90	4
Cedarbrook	138	144
Baederwood	185	22
Old York Rd.	183	30
St. Martins	77	255
Riverton	224	10

The findings at the Ashbourne Golf Course constitute a new record. Six larvae of A. castanea were found in a field just north of Moorestown, N.J., on May 31, 1934, the first record from Moorestown. At two places, Baederwood and Cedarbrook, grubs are more abundant than in the spring of 1933, while at St. Martins there is a slight reduction in numbers.

H. C. Hallock, of the Westbury, N.Y., laboratory, reporting on larval surveys for the Asiatic garden beetle made on the Stevens estate at Jericho, N.Y., gives data on the abundance of larvae in sod land during May, as follows:

Week ending	Larval instars		Average immature stages per sq. ft.
	Second	Third	
			<u>Number</u>
May 5	233	92	32.5
12	155	77	23.2
19	132	144	27.6
26	23	256	27.9

The grubs of the Asiatic garden beetle ranged in numbers from 2 to 79 per square foot at Jericho, N.Y., during the month of May, with an average of 27.8 per square foot for the entire month.

Abundance of larvae of the oriental beetle.--H. C. Hallock, in making larval surveys for the oriental beetle (Anomala orientalis Waterh.) during May, found that the third-instar larva was the predominant stage in the field. Two pupae were found on May 28 and a few second-instar larvae were found throughout the month. The following table gives detailed information on the stages of the oriental beetle on the Stevens estate at Jericho, N.Y., during May.

Weed ending	Larval instars		Average immature stages per sq. ft.
	Second	Third	
	Number	Number	Number
May 5 -----	8	144	15.2
12 -----	13	111	12.4
19 -----	2	146	14.8
26 -----	1	138	13.9

The oriental beetle larvae were thick in survey areas 5 and 10 on the Stevens estate, where the grass has been killed in large irregular areas, totaling between 1 and 2 acres, where the ground is entirely bare. At the points of severest infestation the larvae have killed all vegetation.

TRUCK CROP AND GARDEN INSECTS

Crop rotation effective control for sand wireworm.--J. N. Tenhet's investigations of Horistonotus uhlerii Horn at Fairfax, S.C., have developed the fact that indirect control, based on crop rotation and increased soil fertility, is proving fully as effective as had been hoped. The question as to whether or not the wireworm population of a given field would increase as the soil fertility was built up, can now be answered in the negative.

Wireworm oviposition at Alhambra, Calif.--R. E. Campbell who has been making investigations of the wireworm Melanotus longulus Lec., reports as follows: "Six females of this species, taken during the period April 6 to 20 and confined in outdoor oviposition cages, began oviposition on April 16 and continued until May 26. The average number of eggs deposited, the length of the preoviposition and oviposition periods, and the longevity of both males and females were found to be considerably lower than the averages obtained in 1933. Deposition was greater during the second week, whereas, in previous years, the majority of eggs were deposited the first week. Apparently this was due to the mild temperatures prevailing throughout the oviposition period."

Physiology of Pheletes canus Lec.--Examinations conducted by C. E. Woodworth, of the Walla Walla, Wash., laboratory, indicate that this wireworm has approximately the same number of white blood cells per cubic centimeter as has man, namely, 5,000, suspended in a dense serum. The size of the cells is about that of the normal small lymphocyte of man. The quantity of blood is estimated as about 10 cubic millimeters to a moderately large specimen. In the same studies it was determined that the wireworm possesses a sympathetic nervous system. One ganglion is to be found directly above the pharynx, the other two immediately below the supracoelopharyngeal ganglion. In addition a plexus has been found above the two lateral ganglia. From the ganglia and the plexus nerve strands are given off, indicating that the fore intestine, heart, and pharyngeal valves are at least under partial sympathetic control.

Wireworm larvae feeding abnormally at this season.--On his investigation for the control of wireworms, R. S. Lehman, of the Walla Walla, Wash., laboratory, reports: "About 5,000 ground-wheat baits were placed in the soil during the month. The wireworms do not appear to have been feeding as they normally do at this time of the year, as less than one wireworm per bait was obtained from the 5,000 baits. Normally, one would expect to obtain at least an average of 5 wireworms per bait. If the number of wireworms per bait does not increase during the first part of June it will be necessary to resort to sifting the soil in order to obtain the necessary wireworms for the winter experiments."

Beet leafhopper breeding high populations in Salt Lake City area.--E. W. Davis, of the Salt Lake City, Utah, laboratory, reports as follows: "The nature of the weather this spring has manifested itself in regard to the activity of Eutettix tenellus Bak. in the local breeding areas. As a rule, the first brood matures the latter part of June, at about the same time the first brood matures from the bugs that have migrated from the perennial breeding areas. This year the brood from the local breeding area matured during the first part of May, which coincided with the latter part of the migration from the perennial breeding area."

It has been extremely difficult this year and most impossible to determine to just what extent the local breeding areas contributed tenellus to the adjacent beet fields. At present the populations are breeding up extremely high in these breeding areas."

Good control of beet leafhopper by spray in Sacramento Valley.--W. C. Cook, of the Modesta, Calif., laboratory, states that "The strongest evidence of the effectiveness of control work in the natural breeding areas of beet leafhoppers this year lies in the fact that high populations and quite general curly-top damage are being found in the Salinas Valley and in several southern California areas that are rarely damaged. There is a general outbreak of curly-top over the entire western beet growing area and the Sacramento Valley is the only area of any size that is not suffering. It is impossible to state how much of this protection is due to control work, but certainly the control has contributed to it in some degree."

Survival of Mexican bean beetle low in Estancia area.--R. L. Wallis, of the Estancia, N. Mex., laboratory, reports that the average percentage of beetles recorded alive in the hibernation cages is 4.56. This is very low as compared with the same month in previous years. It is noted that on the average there is a larger percentage of beetles alive in the sections from the north-slope exposure than from the south-slope exposure. This is contrary to records of previous years and may be explained by the fact that more moisture is retained in the hibernation material on the north-slope exposure than in the material on the south-slope exposure.

Drought retards emergence of Mexican bean beetle.--N. F. Howard, Columbus, Ohio, reports that owing to the severe drought, emergence of insects from hibernation has been greatly retarded. The survival of Epilachna corrupta Muls. in hibernation was high in April and is presumably still high, but

to date very few have emerged. A shower brought out a considerable number, but not as many as would have emerged if the rainfall had been normal. Mr. Howard notes further that no complaints have been received during past month concerning insect damage.

Drought reduces pea aphid infestations in Wisconsin.--J. E. Dudley, of the Madison, Wis., laboratory, reports that "the drought continued in the principal pea-growing sections of Wisconsin and record high temperatures occurred throughout the last 2 weeks in May. These high temperatures, and especially the high maxima, were detrimental to the aphids (Illinoia pisi Kalt.) and the infestation dropped off noticeably, so that by the latter part of May there was no serious infestation in any of the fields inspected around Madison and the reproduction of aphids was very small. The effect of continued high temperatures on reproduction of the aphid has been carefully observed in the life-history studies in a field insectary for 2 years. Such high temperatures for a time accelerate the growth and reproduction of aphids but soon result in a greatly shortened longevity, lessened reproduction, and death or lack of reproduction in the following generation."

Winged pea aphids appear in Wisconsin.--J. E. Dudley, of the Madison, Wis., laboratory, reports as follows: "During the first part of May the sweepings in alfalfa showed a continued large number of alate pea aphids which without question had flown in from further south. These winged aphids and their progeny constituted a very large proportion of the total infestation on alfalfa for approximately the first half of May. After that it was impossible to separate the progeny of winged migrants and the progeny of stem mothers."

Mole cricket attacks reaching serious proportion in the South.--W. A. Thomas of the Chadbourn, N.C., laboratory, reports: "The mole cricket (Scapteriscus vicinus Latr.) population, which has been gradually building up during the past 4 years has reached the point where growers are having considerable trouble in maintaining a stand of plants. This is especially true of tobacco. One grower reported that most of his crop was destroyed by this insect. On our recommendation, he applied poison bait to the affected area and 2 weeks later reported that he had seen no further injury. He was particularly delighted with the poison bait, because it not only killed the mole crickets but also destroyed the cutworms at the same time. Other growers here are turning to the poison bait for relief against this pest."

Sulphur effective as a fumigant for mushroom houses.--A. C. Davis, of the Takoma Park, D.C., laboratory, reports as follows on his investigations on sulphur as a control for mushroom pests: "In the summer clean-out of mushroom houses, when the temperatures rise above 70° F., a mean concentration of 4.0 mg per liter, maintained for 100 minutes, should give a 100 percent kill of all insect and mite pests. In the fumigation chamber at 100° F., and about 90 percent relative humidity, which as nearly as possible duplicates the conditions along the floor level of mushroom houses during the heat, mean concentrations of 7.04 and 7.86 mg per liter for 130 and 80 minutes, respectively, gave 100 percent kill. It seems safe to say that a mean concentration of 8 mg per liter for 100 minutes can be depended upon to give complete clean-up of insect and mite pests. At 120° F., in the fumigation chamber, about 3.50

mg per liter for 70 or 75 minutes seems to be the critical point. A mean concentration of 4.0 mg per liter for 60 or 70 minutes would be as low as could be safely depended upon for control of insects and mites. Under the conditions existing in mushroom houses during the peak of heat it is apparently impossible to obtain the necessary concentration."

Retarded larval phases of the narcissus bulb fly.--C. F. Doucette, reporting on investigations of the larger narcissus bulb fly (Merodon equestris Fab.) says: "Emergences have been recorded during May from larvae definitely known to be of 1932 origin; 24 males and 18 females have emerged, indicating that retardation does not involve a sex factor. The color combinations of these adults vary as in normal adults, indicating that there is no special color variety or strain involved. The emergence period corresponds closely with that of normal adults."

Calcium cyanide effective against Mexican mealybug.--H. H. Richardson, continuing his studies on the effectiveness of overnight fumigations with calcium cyanide for the control of Phenacoccus gossypii T. & Ckll. on chrysanthemums grown under glass, confirmed the results of previous experiments which indicated that 1/4 ounce dosage will apparently produce a very high kill of adults and nymphs, as well as of a large percentage of the eggs. A second fumigation within a week or two produced complete kill of the insects surviving the first fumigation. Apparently a dosage of 1/4 ounce is nearer the upper limits of tolerance of chrysanthemum stock plants although, when the plants were thoroughly dried (not watered for 30 hours prior to fumigation), no injury occurred.

Machine developed for atomizing oils in the field.--The Madison, Wis., laboratory is developing an atomizing machine for use in pea aphid control. The machine consists of a 4-horse power aluminum engine weighing 90 pounds; a 2-cylinder compressor of 12 cubic feet capacity per minute, made of aluminum and weighing about 75 pounds; a 5-gallon air-compression tank; and a 3-gallon oil tank. On the oil tank is mounted an oil filter, such as is used on a furnace oil burner. On the boom are mounted 12 nozzles designed by T. E. Bronson during the winter months. Compressed air and oil under pressure are delivered to each nozzle. The whole outfit is mounted on a light 2-wheel trailer and by means of angle irons the trailer is made into a hood 14 feet and 10 feet wide, which confines the atomized oil while it is circulating among the pea foliage.

CEREAL AND FORAGE INSECTS

Status of hessian fly in south-central Pennsylvania.--Daily observations by J. S. Pinckney at Carlisle, Pa., showed that the oviposition period of the flies of the spring emergence of Phytophaga destructor Say in the vicinity of Carlisle began on April 19, reached its height between April 26 and May 9, and was practically over by May 14, although a few eggs were found until May 23. Surveys by J. S. Pinckney and E. J. Udine of hessian fly abundance in New York and in Adams and Perry Counties in Pennsylvania showed heavier infestations than were expected. In 12 fields examined the minimum infestation was 2 percent, the maximum 40 percent, and the average 21 percent. The culm was used as the unit of examination.

Hessian fly parasite Polygnotus pleuron Wlk.--C. C. Hill, Carlisle, Pa., reports that "out of 65 hessian fly puparia containing P. pleuron received from France we have reared to date 46 adults, about two thirds of which were females. Most of these emerged after the oviposition period of the fly was over, which made futile any serious attempts to introduce them into the field this year. Efforts have been made, however, to breed this parasite in laboratory cages, and in this connection a good many hosts have been successfully parasitized and are now in the process of being reared. P. pleuron oviposits into the egg of the hessian fly. Its manner of oviposition is essentially the same as that of Platygaster herrickii Pck. and very similar to that of P. zosine Wlk. Its potential progenitiveness is high, examination of a female 3 days old showing the presence of from 650 to 700 developed ovules. This is much higher than that of the host, which averages only 230 eggs per female in the spring generation. One P. pleuron was observed to oviposit into 248 host eggs in the course of 12 days. Males were observed to mate and females to oviposit on the same day they emerged."

Hessian fly resistance in wheat may be modified by differences in soil fertility and moisture.--E. T. Jones, Wichita, Kans., reports that superficial observation of recent flat-tested wheats indicate that, while a predisposition to fly resistance is inherited in some varieties of wheat, this resistance is largely physiological in character and may be modified by soil fertility and moisture. This conclusion was reached from an examination in May of 50 plants from each of 60 10-inch flats in which the soil was treated with various essential elements.

Large acreages of California land infested with grasshoppers in May.--According to C. C. Wilson: "By the end of May 350,000 acres of range and cultivated land were estimated to be infested with grasshoppers in 17 counties of the State. The most striking activity and damage to cultivated crops were in the coastal counties where adult migration started from the hills early in May on account of the drying up of the usual food plants. The Sacramento Valley is very lightly infested and has a delayed hatching of the grasshopper eggs in alfalfa fields. In the foothills only a few grasshoppers have been observed. The following species of grasshoppers are involved in the infested territory: Melanoplus mexicanus Sauss., Camnula pellucida Scud., Oedaleonotus enigma Scud., Hippiscus californicus Scud., Melanoplus marginatus Scud., and M. femur-rubrum DeG."

Grasshopper control in Oregon.--On April 23, bait materials to the extent of 250 tons, dry-bran basis, were allotted to Oregon. These materials were distributed to 6 counties by May 23, all but the most inaccessible of the counties (Grant) being supplied with the major portion of their allotments by May 8. On May 2, 50 tons additional were authorized for Tule Lake, in Siskiyou and Modoc Counties, Calif., to be used under the direction of C. A. Henderson, County Leader of Klamath County, Oreg. Materials for Tule Lake were supplied by May 8. On May 16, 50 tons additional were allotted to Harney County, Oreg., which was late in organizing, as there was no county agent. Harney County was supplied with its complete allotment by May 26. The

Minneapolis office of the Grasshopper Control Project located and shipped in all supplies. Excellent kills have already been reported by the county leaders of Lake and Klamath Counties. The formula recommended by J. R. Parker--100 pounds of bran and 2 quarts of sodium arsenite, without additional ingredients--was used in these cases.

Empusa aphidis successfully grown on media.--L. P. Rockwood, Forest Grove, Oreg., reports that Empusa aphidis Hoffman, the fungus that caused an epidemic of disease among pea aphids (Illinoia pisi Kalt.) and checked the alarming outbreak of aphids on vetches and field peas in the Willamette Valley in April of this year, was successfully grown on a medium consisting of egg and vetch infusion, beaten up together, and also on salmon. Pure cultures were obtained from 3 out of 24 original specimens. Aseptic conditions of collection of the original material in the field appeared to be a prime factor in getting pure cultures. This adds one more species of Entomophthoraceae to the three others that have been recorded as successfully grown by American workers--Entomophthora pseudococci Speare, by Dr. A. T. Speare in Hawaii, and Entomophthora sphaerosperma Fres. and Empusa sp., by Dr. Wm. H. Sawyer, Jr., of Bates College. One other species has been grown in Europe.

Wheat injured by Sphenophorus confluens Chit.--T. R. Chamberlin, Forest Grove, Oreg., reports that on May 16 a field of winter wheat near Beaverton, Oreg., was found to be heavily infested by this weevil. Oviposition was taking place in the wheat stems and small larvae were common. Two samples from the field showed the following conditions:

May 16 -	Stems containing larvae or eggs -----	28.4 percent
	Stems containing vacated larval tunnels ---	<u>27.3</u> percent
	Total stems damaged -----	55.7 percent
	Uninfested (some showing feeding punctures of adults)-----	44.3 percent
May 25 -	Stems containing larvae or eggs -----	26.4 percent
	Stems containing vacated larval tunnels ---	<u>36.9</u> percent
	Total stems damaged -----	63.3 percent
	Uninfested (some showing feeding punctures of adults)-----	36.7 percent

Eggs were usually found in the center of the stem close to the ground in the joints directly above or below the adventitious roots. As the stem tends to be more or less solid in this region, the eggs may be placed in spherical pockets excavated by the adult or in tunnels. Sometimes the egg was found in a tunnel or hollow portion of the stem 4 or 5 mm distant from the oviposition puncture. Considerable injury was done the stem by small larvae of the first or second stage, tunnels almost 2 inches long and filled with frass and having side pockets sometimes being made by a single larva. Several stems practically severed by larvae have been found. As the species is a large one doubtless many stems could be destroyed by a single larva before it reached full growth and, unless there is considerable mortality among the small larvae, there seems little chance for the wheat growing in field.

In the laboratory, eggs have hatched as late as 15 days after they were taken from the field, and the average incubation period at this time of the year apparently is more than 2 weeks. An egg laid in the laboratory on May 23 had not hatched by June 1. The infested wheat was planted on November 5, 1933, on land said to have been in grass for 2 years. It was expected that some of the various grasses now fairly common in the field would be found badly attacked by this weevil but, as a matter of fact, wheat seems to be preferred in this field. In the various grasses examined only one egg was found and this was in timothy.

Bollworm and tobacco budworm attack flax in Georgia.--G. W. Barber, Savannah, Ga., reports an outbreak of caterpillars of Heliothis obsoleta Fab. and H. virescens Fab. near Estill, S.C. Here, 500 acres of flax is being grown for the purpose of studying the possible production of flax in the South. In this crop, considerable infestation by these species of Heliothis occurred during the last 3 weeks of May. Injury was of two types. In flax planted in March, and in which seed bolls were available, the caterpillars attacked the green bolls, hollowing out the contents. In several fields showing this type of injury, planters estimated a possible damage of 30 percent of the seed. In fields planted in April, and in which seed bolls had not developed, the caterpillars attacked the flower buds, the incipient seed pods, the tender leaves, and the tender stems at the tips of the plants. By May 24 plants in these fields had about their upper fourth wholly devoured. This type of injury resulted in somewhat greater damage to the crop than in earlier plantings. On May 28 a severe rain storm, with wind of 35-mile to 40-mile velocity, laid down the flax and flooded the fields under observation. Subsequently, only large caterpillars of the species mentioned were found in the field and most of the small larvae evidently were knocked from the plants and drowned. By May 31 caterpillars had become scarce but moths of both species were abundant. Both larvae and moths appeared to occur in about the proportion of one of H. virescens to five of H. obsoleta.

Effects of warm weather on alfalfa weevil.--G. I. Reeves, Salt Lake City, Utah, reports that "May has been characterized by a continuation of the exceptionally warm weather that prevailed throughout the winter and spring in the entire area infested by the alfalfa weevil. This has resulted in an unusually early maturity of the alfalfa crop, an unusual opportunity for weevil oviposition, and great activity on the part of Bathyplectes curculionis (Thompson), the ichneumonid parasite. It has also furnished a rare opportunity to determine the long-suspected damping effect of early mild spring weather upon oviposition, which explains why the weevil is not a pest in mild climates. In general, the attack of the larvae upon the first crop ran its course and ended before the crop was mature, so that in spite of the very long egg-laying season, control measures were rarely necessary. The temptation has been great, however, for farmers to delay cutting and so rear too many weevils to maturity and store up trouble for 1935."

Spread of Trichogramma minutum Riley.--H. A. Jaynes, Jeanerette, La., reports that an experiment to determine the distribution and spread of Trichogramma was carried on in a sugarcane field near that place, during the latter part of April and early in May. Two sets of 40 stakes were arranged

with 8 each at 25, 50, and 75 feet distances from the center, and 16 stakes at 100 feet from the center. At 8 of these points, cards containing fresh bagworm (Thyridopteryx ephemeraeformis Haw.) eggs were placed on these stakes, at a height of 5-1/2 feet, in addition to the cards placed at a height of 1-1/2 feet on all stakes. Each card was protected from the sun by a small shingle. Six sets of cards were used during the period of 9 days. The center of the check stakes was 1,200 feet west of the point where the releases were made. Approximately 40,000 Trichogramma were released on April 26, and another 40,000 on April 27.

No parasitization was obtained on any of the cards of the 6 sets placed on the check stakes, or from the first set of cards, which were exposed from April 26 to 27. The second set, exposed from April 27 to 28, obtained parasitization on 7 different cards, at 25 feet southeast, at 50 feet southeast, south (low), north (high), north (low), and at 100 feet east (low), and east (high). On April 26 wind was first from the southeast and later fairly strong from directly south. On April 27 there was a slight breeze from the southwest. On April 28 there was a fair breeze from the north. The third set of cards, exposed from April 28 to 30, obtained parasites at 25 feet southeast and at 50 feet south (high). The fourth set of cards, exposed from April 30 to May 1, obtained parasitization at 25 feet south only. The fifth set of cards, exposed from May 1 till May 2 (2 p.m.), obtained parasitization only at 50 feet south (high). A large number of Trichogramma were still on the center stake on May 1. The sixth set of cards, exposed from May 2 (2 p.m.) till May 4 (noon), obtained parasitization on 5 cards, all at 50 feet east (high), southeast, south (high), south (low), and north (low). It will be noted that parasitization was obtained as far as 100 feet from the source of origin within 48 hours after the first release of Trichogramma, which compares very closely with the results of last year in which parasitization was obtained at 25, 50, and 75 feet within the first 24 hours after release.

FOREST INSECTS

Mortality of Douglas fir beetle.--W. D. Bedard, of the Coeur d'Alene, Idaho, field laboratory, reports that while studying the Douglas fir beetle (Dendroctonus pseudotsugae Hopk.) in northeastern Washington, certain trees were noted in which the entire brood of new adult beetles was dead. These beetles had not yet passed the winter and, as other trees close by contained living brood, this mortality could not be attributed to extreme high or low temperatures. J. C. Evenden, Coeur d'Alene, has also noted this occurrence in northwestern Wyoming and northern Montana. It is possible that this mortality is due to an unknown disease which is sufficiently prevalent to be, worthy of additional study.

Experimental control of the Douglas fir beetle.--Mr. Evenden reports that experimental control measures were instituted in May against an outbreak of the Douglas fir beetle in the Shoshone National Forest, Wyoming, the objective being the preservation of parasites. Formerly, control operations against this insect have been conducted in the fall of the year, as it is practically impossible to complete a project in the spring prior to the

emergence of the overwintering broods. Though fall control is successful in destroying the insect broods, it has the disadvantage of destroying the beneficial insects as well, as the infested trees are felled and burned. Recent studies have shown that the bark beetles make two attacks. The overwintering broods emerge in May and attack, then emerge for their second attack during the latter part of June or early in July. Coeloides brunneri Vier., the most important parasite of the Douglas fir beetle, overwinters with the beetle broods but does not emerge until about the time the parent adults are emerging from the trees attacked in May for their second attack. To preserve these parasites, control measures are being directed against the May attacks during the period between the first and second attacks. This experiment should result in a saving of timber by preventing the second attacks, in the preservation of parasites to care for any portion of the infestation missed during the project, and in a material reduction in the cost of the operation.

Forest Service completes NIRA control projects.--J. M. Miller, of the Berkeley, Calif., field laboratory, reports that all bark beetle control projects in California on which winter and spring treating work has been underway were completed by April 15. This is about 3 weeks earlier than the usual seasonal date for closing down such projects. It was fortunate that plans were made for this early completion of control work as the overwintering broods of beetles started their emergence about one month ahead of schedule. Precipitation for the spring period has been extremely light and the fire hazard became so great by the first of April that it was necessary to put on additional men to guard control fires. This latter factor has added materially to the cost of the work on certain areas. One of the more important of these winter projects was a combined program by the Stanislaus National Forest and the Yosemite National Park. This work was directed toward the control of a large zone of infestation along the west boundary of the park which threatened a body of magnificent sugar pine and ponderosa pine timber on national forest, patented, and park lands. Approximately 3,300 trees with a volume of 5,500,000 board feet on 47,000 acres were treated during the past winter and spring. The primary infestation consisted of the western pine beetle in yellow pine and the mountain pine beetle in sugar pine.

The Hall's Flat project on the Lassen National Forest was another control undertaking completed by March 21. This project covered 18,000 acres, practically all Forest Service timber. A total of 4,155 trees with a volume of 4,000,000 board feet were treated. The species treated consisted of western pine beetle and the pine flathead in ponderosa pine and Jeffrey pine. The Badger Springs project on the Modoc National Forest also completed within this period covered 41,000 acres and accomplished the treatment of 5,828 trees with a volume of 5,500,000 board feet.

Infestation types changing on Modoc National Forest.--K. A. Salman, of the Berkeley, Calif., field laboratory, says that an exceptionally well-kept set of spotters' records on the Badger Springs project has made possible a detailed analysis of the composition of the infestation that comprised the overwintering broods. The area of bark surface infested by several

species of insects was obtained from a large series of infested trees studied during the course of the project. These records show a very positive trend toward an increase of species of bark borers other than Dendroctonus brevicomis Lec. in ponderosa pine. Following the heavy winter kill of 1932-33, the amount of infestation by the pine flathead Melanophila californica Van Dyke and by Dendroctonus monticolae Hopk. increased in a very striking manner. Prior to 1933 these two species composed a very minor part of the total bark-surface infestation. However, in the overwintering broods of 1933 these two species occurred as primary species in 53 percent of the trees. The increase of D. monticolae in ponderosa pine on this area may be of special significance. Formerly an insignificant species in the composition of the infestation, it was present this winter in 29 percent of the trees.

Another noteworthy tendency revealed by these records was a distinct zoning of the infestation within the area according to insect species and intensity of loss. In the border areas, where the pine type meets the sage brush, mixed infestations with the flathead predominating compose the bulk of the infestation. It is here that the heaviest losses occur. Further in from the fringe a mixed infestation of D. brevicomis, M. californica, and D. monticolae occurs. In the heavier timber on the better sites furthest in from the fringe only a pure infestation of D. brevicomis exists, with relatively light losses.

Laboratory tests show low temperature killing points for western pine beetle.--A long series of tests have recently been completed under the direction of J. M. Miller, of the Berkeley, Calif., field laboratory, to determine the temperature points at which overwintering broods of D. brevicomis are killed in the bark. Results have been strikingly consistent. Mortality of larval material from a given region develops within a definite range of temperatures and there is a fixed point below which none are able to survive. Three distinctly separated regions with wide climatic differences were studied in this respect. These were the central Sierra Nevada region in California, the Ochoco National Forest in eastern Oregon, and the Coeur d'Alene National Forest in northern Idaho. In material from all three regions the larvae were found to show some mortality when exposed to temperatures between 2.5° above and zero Fahrenheit, with mortality increasing as temperatures were lowered below zero. The point at which 100 percent mortality occurred, however, differed slightly for each region. In the Sierras this point was determined to be -7.5° F.; in the Ochoco area -10.0° F., and at Coeur d'Alene -12.5° F. Tests run with D. monticolae from California, Oregon, Idaho, and Montana show much consistency. It is apparent that this species reacts to low temperatures in a manner different from D. brevicomis, and that seasonal preparation for cold periods may be something of a factor. Much further study will be necessary before broad conclusions can be reached for the mountain pine beetle.

Beech scale affected by low temperatures.--R. C. Brown, of the Melrose Highlands, Mass., field laboratory, spent the latter half of May near Liberty, Maine, studying the beech scale in woodland plots of beech that he established in 1933. He reports that the scale was very definitely affected by the low temperatures of the past winter. In most plots over 99 percent

of the scale above 1 foot from the ground were found to be dead, while at 6 inches from the ground little mortality was noted. The twice-stabbed lady-beetle (Chilocorus bivulnerus Muls.), which feeds on the scale, was fairly abundant in the plots, being noticeably more abundant at the bases of trees where the scale was alive. No eggs of the beetle were noted but 49 adults were counted on one tree within 10 feet of the ground.

Starvation resistance of gypsy moth larvae.--W. L. Baker, of the Melrose Highlands, Mass., field laboratory, started three trays, each containing 100 newly hatched gypsy moth larvae, in a screened insectary on May 14 to obtain information on the length of time such larvae can live without food. In one tray moisture, in addition to that present in the air, was provided. In this tray the larvae lived an average of 10.9 days, while in the other two trays the average was 8.2 days. These data differ considerably from those given by Forbush and Fernald in their book, The Gipsy Moth, published in 1896. They offered data showing that newly hatched larvae lived an average of 4.2 days in the absence of food, but these data were obtained by placing larvae in corked vials where conditions were doubtless more abnormal than in the tray experiments conducted by Mr. Baker.

Further notes on satin moth parasites in Washington.--In the last Monthly Letter of the Bureau reference was made to the recovery of two European parasites, Apanteles solitarius Ratz. and Meteorus versicolor Wesm., from the satin moth in the State of Washington, these parasites having been liberated there during the last few years from material forwarded from the Melrose Highlands laboratory. In May the laboratory received a very interesting report from Randall Latta, of the Sumner, Wash., laboratory, regarding the abundance of Apanteles solitarius in satin moth infestations in that State. Mr. Latta spent 3 days in May visiting satin moth infestation from Centralia to Bellingham and found the Apanteles present at every place where he stopped to make observations. The extent to which the parasite has multiplied and spread, as indicated by this report, is quite remarkable. Only one colony was liberated in Washington. It consisted of 13 males and 234 females and was put out at Kent on June 6, 1932. Bellingham is nearly 100 miles north of Kent, air line, and Centralia is about 35 miles southwest. The following statements taken from Mr. Latta's report indicate the abundance of Apanteles at some points visited: "At Kent satin moth larvae were not overly plentiful, but Apanteles cocoons were plentiful, every crevice in the bark having one or more; at Longacres, 6 miles from Kent, willow trees were literally alive with caterpillars and the fence posts under the trees were so thickly covered that the wood was not visible, the masses on the fence posts being mostly webbed together and from 15 to 50 Apanteles cocoons being present in each mass; at Sumner, about 12 miles from Kent, as high as 8 to 10 or 15 cocoons could be found under one web in a crevice no larger than would hold my index finger; at Marysville, about 45 miles from Kent, 210 cocoons were counted on the under side of a branch 6 feet long and 3 inches or less in diameter."

Notes on the larch case bearer.--J. V. Schaffner, Jr., of the Melrose Highlands field laboratory, has noted, in connection with collections of the larch case bearer (Coleophora laricella Hbn.) made at established points in

New England and New York for records on intensity of infestation and parasitization, that in some instances a considerable number of larvae were removed from their hibernation cases, presumably by birds. The highest percentage of larvae thus removed was noted in a plot in Sydney, Maine. Of 400 cases examined the larvae had been removed from 170. A total of 3,380 adults of a parasite, Angitia laricinella Strobl., of the larch case bearer that issued from material received from W. F. Sellers of the Budapest, Hungary, sublaboratory, were liberated in four of these larch plots in May.

White grub investigations.--R. A. St. George, of the Asheville, N.C., field laboratory, reports that during the latter part of May H. R. Johnston, a graduate of N. C. State College, was transferred to this division to assist in the white grub project being conducted in cooperation with the State forest nurseries located at Clayton, N.C., and at Camden and Georgetown, S.C. Intensive life-history studies have been begun to determine the life cycle of those species found to be of economic importance. Tests are also being continued to determine which chemicals are most satisfactory to use in the prevention and control of May beetle damage. Preliminary results indicate that dosage of acid lead arsenate applied to quite acid light sandy loams, at a rate of 1,500 or more pounds per acre, remain in the soil in sufficient amounts, even after 2 years, to cause a marked effect on the germination of pine and locust seeds and a stunting of growth of the seedlings.

As the result of excess rainfall during the past 2 weeks at the new Georgetown, S.C., nursery, Phyllophaga larvae have been quite active causing considerable damage to the pine seedlings, which have attained a height of only 3 to 6 inches. The grubs present are those that occur naturally under the patches of grass in the young longleaf pine stands. This injury is being kept at a minimum through the use of miscible carbon bisulphide. It has been determined that dosages of 1 quart to 50 gallons of water, using 3 pints per square foot of soil surface, are effective.

C. B. Eaton, a recent graduate from New York State College of Forestry, reported for duty at Asheville, N.C., on June 1, to assist in the southern pine beetle studies being conducted at the Bent Creek laboratory.

Winter killing of southern pine beetle.--R. A. St. George also reports that a recent check-up of the effect of subzero temperatures on overwintering broods of the southern pine beetle (Dendroctonus frontalis Zimm.) in shortleaf, pitch, and scrub pine trees near Fairfax, Va., verifies previous estimates of nearly a complete winter mortality of all stages of the brood. Only a very few eggs, found occasionally in the south side of a tree, were able to survive. No new attacks have been found so far this season.

Control against mountain pine beetle successful.--J. A. Beal, of the Portland, Oreg., field laboratory, writes that the infestation of Dendroctonus monticolae in the highly scenic areas of Mount Rainier National Park has been successfully controlled again this spring as shown in the small number of new infested trees found. This infestation has been reduced from a yearly loss of over 1,000 infested pines in 1931 to less than 100 trees for the past 2 years. This year only 75 new trees could be found.

Cool weather delays emergence of western pine beetle.--W. J. Buckhorn, of the Portland, Oreg., field laboratory, reports that development of Dendroctonus brevicomis Lec., which was very rapid during the month of April, has been greatly retarded during May by the generally lower temperatures incident to cloudy weather, frequent rains, and snow. Last year the peak of emergence was not reached until the middle of July. This year, owing to an early spring, emergence was well under way by April 20 on the south side and portions of trees warmed by the direct rays of the sun, but May conditions retarded development and now emergence is only about 85 percent complete. On the north side of trees and those portions warmed only by air temperatures, emergence is just starting and, although the bulk of the brood is now in the adult stage, about 30 percent is still in the pupal stage. In spite of this retardation, emergence this year will be generally much earlier than last.

"Ventilation holes" a misnomer.--Mr. Buckhorn also states that the vertical burrows that occur at intervals in the egg tunnels of the western pine beetle and extend from the roof of the tunnel to the surface of the bark have been called "ventilating burrows", or "ventilation holes", and are thought to serve this purpose primarily, in addition to serving as turning niches and as holes through which boring dust could be ejected. Recent studies show very definitely that these are not ventilation holes, but exit holes of the emerging adults. An examination of a large number of western pine beetle attacks at various stages of development showed that during the construction of egg galleries any hole cut to the bark surface is not allowed to remain open but soon is tightly plugged with frass. Not until an adult definitely abandons its tunnel and leaves the tree is a ventilation hole left open, and not until then are any secondary insects found under the bark. However, the adults may leave the tree at any stage of gallery construction and, as a few apparently become dissatisfied with their work before it is well started, openings are left for the entrance of secondaries at an early stage of development. Prior to emergence the adults were found to feed in the cambium and enlarge the gallery into an irregular chamber free from frass. The adult emergence holes are bored directly to the surface from these feeding chambers. A tree cage placed over 2 square feet of infested bark, which developed 72 ventilation holes, caught 66 emerging adults this spring. The 6 extra holes were probably caused by some emergence last fall. It is also possible that more than one adult may use the same exit hole.

Carpenter ants damage homes in Pacific Northwest.--F. P. Keen, of the Portland, Oreg., field laboratory, states that carpenter ants (Camponotus spp.), largely replacing termites in the Pacific Northwest, appear to be the insects of greatest destructiveness to wooden buildings, fence posts, telephone poles, and other wooden structures. Numerous cases of excessive damage have been called to our attention in the past few months. In one case the studding and woodwork of a plastered house were riddled with tunnels that extended from the ground to the second story. Extensive repairs had to be made, but all of the infested woodwork could not be removed. On our recommendation, sodium fluosilicate was injected into the tunnels and proved to highly effective in destroying the colonies and halting damage.

COTTON INSECTS

Changes in field laboratories.--The field laboratory at Eufaula, Okla., where experiments in boll weevil control under Oklahoma conditions have been conducted under the direction of H. C. Young, in cooperation with the Oklahoma Experiment Station and Extension Service, has been discontinued. Considerable data on the abundance and damage caused by the weevil in the State and control measures suitable for local conditions were obtained and will be published in the near future by the experiment station. On June 1 Mr. Young was transferred to State College, Miss., where he will work in cooperation with the Mississippi Experiment Station on cotton insect problems.

E. W. Dunnam, in charge of the cooperative bollworm investigations at College Station, Tex., was transferred in June to Stoneville, Miss., to take charge of a new project for studying the factors influencing weevil resistance in cotton. His new assignment will be to work in cooperation with the cotton breeders of the Department, the Mississippi Experiment Station, and others in an effort to develop cotton varieties more resistant to weevil damage.

The laboratory at Brownsville, Tex., has been closed for the summer and T. C. Barber transferred to Buckeye, Ariz., to study the hemipterous insects of cotton in that section.

F. A. Fenton, who has been in charge of the pink bollworm laboratory at Presidio, Tex., has resigned, effective July 1, to accept a position as head of the Department of Entomology of the Oklahoma A. & M. College and Experiment Station. A. J. Chapman, of the Presidio staff, will be temporarily in charge of the laboratory.

C. F. Rainwater has been transferred from Tallulah, La., to Florence, S. C., to study the cotton root aphid and thrips. This new project will be under the direction of F. F. Bondy and in cooperation with the South Carolina Experiment Station.

Cotton leaf worms appear early.--R. L. McGarr collected two half-grown leaf worms (Alabama argillacea Hbn.) on cotton in the vicinity of Port Lavaca on May 24. Additional specimens were found on May 26 near Gregory and Robstown, Tex. Adults emerged during the first week of June. This is the earliest record of leaf worm appearance in the United States since 1926, when they were found at Wharton, Tex., on May 18. No reports of their appearance in other sections have been received this season.

Boll weevil activity.--Reports from field laboratories and correspondents indicate that boll weevils are very abundant this season in all infested sections, except along the Atlantic seaboard. At Florence, S. C., the severe cold of last winter caused a heavy mortality among hibernating adults and weevils are about half as abundant in the fields as they were at this time last year. At Tallul' La., R. C. Gaines and assistants, in their field examinations during the last week in May, found 303 weevils per acre, as compared with 126 in 1933 and 188 in 1932. Clay Lyle, Entomologist of Mississippi, reports an average of 145 weevils per acre on the infested farms and 75 per acre for all farms visited in Mississippi during the week ending June 4. This compares with an average of 118 per acre for the infested farms and 60 per acre for all visited on the same date last year. H. C. Young reports an average of 212 weevils per acre on 5 fields examined in

Forrest County, Miss., during the first week of June.

In the vicinity of College Station, Tex., R. W. Moreland reports weevils are about as abundant in the Brazos River bottoms as last year, the infestations ranging from 0 percent to 3 percent. The infestation in the upland cotton ranged from 5 percent to 26 percent in comparison to 2 percent to 43 percent last year. The cotton in this vicinity is also 2 to 3 weeks later than last year and the survival in the hibernation cages indicates a heavy winter carry-over. Our hibernation cages at Eufaula, Okla., also indicate a much higher survival than last year and C. F. Stiles, of the Oklahoma Experiment Station, reports a heavier weevil population and more inquiries concerning control measures than have been received for several years.

Cotton flea hoppers.--As reported last month by K. P. Ewing, Port Lavaca, Tex., it seemed that the flea hopper (Psallus seriatus Reut.) population would be greatly reduced by the croton clean-up in Calhoun County. However, following a rain on May 6, there was a heavy migration of hoppers to the cotton fields in this area. The migration to the cotton is shown by the catch on the flight screens and the sudden increase in numbers of adult hoppers collected on cotton plants by bud examinations. During April an average of 6.58 hoppers were caught per screen. Beginning with May 7 there was a sudden increase, and an average of 185 hoppers per screen were taken during the month. Similarly, field inspections showed an average of 0.86 adults per 100 buds during the week of April 30 to May 5. The next week, May 7 to 12, the number increased to 40.9, and for the week of May 14 to 19, to 65.7 per 100 buds. Up to this time most of the hoppers were adults, with only 2.7 to 6.4 nymphs per 100 buds. During the week of May 21 to 26 there was a high increase of first-instar and second-instar nymphs, with an average count of 55 per 100 buds, which had increased to 96 by June 2. To further complicate matters and increase the damage, about 20 percent of the acreage in the county is "early" cotton and 80 percent "late" cotton, and the hoppers showed a distinct preference for the early, or large plants. Although more hoppers were caught on the screens in the late fields than in the early fields, showing a promiscuous migration, the oldest and largest cotton was more attractive, and most of the migrating hoppers found their way to the "early" fields.

INSECTS AFFECTING MAN AND ANIMALS

Tobacco products investigation.--In May 11 field tests for control of the fowl tick (Argas unidatus Koch) were carried out with tobacco by-products at Uvalde, Tex., under the direction of D. C. Parman. Most of these tests have been with the tobacco extracts, but 4 tests have been made with the high-boiling fractions of tobacco-stem oils. These oils have been given some quite severe tests to determine if they were toxic to poultry. No toxic effects have been observed to the end of the month and the oils kill all stages of the tick, including the eggs, even though they were in places where the oil did not reach them. While no comparative tests have been made, it appears that these oils are as toxic to the fowl tick as are creosote or anthracene oils that have been used in the past. One test was made with a tobacco extract on spraying the carcass of a large horse. This spray was indicated to kill all blowfly larvae of a very heavy infestation and to prevent further breeding of flies in the carcass. While the spray was fresh--from 2 to 4 days' old--large numbers of adult flies were poisoned. It is hoped that further tests can be made of the extract as a carcass spray.

Mosquito control work in Georgia and Florida.--On May 1 a meeting, called by Mr. Newman, was held in Orlando for the instruction of the regional supervisors recently appointed under the Public Works fund of the Public Health Service for the supervision of FERA mosquito control and sanitation work. The meeting was

attended by the two Assistant State Directors, by three State Board of Health sanitary officers and by the supervisors of the southern districts. W. V. King, Orlando, was asked to present the subject of salt marsh mosquito control. A reduction of the relief funds for Florida by approximately 50 percent for the month of May resulted in the temporary suspension of nearly all work relief projects, including most of the mosquito work. New projects for salt marsh mosquito control have, however, been prepared for nearly all of the counties in which we were previously interested and in some of these work was either resumed before the end of the month or early resumption is expected. Palm Beach County had a small crew (about 25) at work on the Cragen Estate during the week of May 21, and in Martin County a crew of from 50 to 100 men was to return to work on the Jones Point marsh the week of May 28.

On the coast of Georgia the CWA Pest Mosquito Control program included drainage and diking methods for control of breeding places of sand flies. The work was cooperative between M. S. Yeomans, State Entomologist, and W. E. Dove and D. G. Hall, of the Bureau of Entomology. In Chatham County the Federal program was continued as a State project until March 31. Since that time convict labor has been furnished by the County for completion of some of the work. In this county work was carried on in 36 different locations, 55 tidal gates were installed, 47.4 miles of good ditches were constructed with grades, and 101 acres of brush along the edges of the marshes were cleared. "Necks" of marshes were cut off by dikes and ditched so that surface water would drain through automatic tidal gates installed in the dikes. These gates close during high tides and prevent ingress of salt water. They open at low tide to permit the drainage of fresh water resulting from rainfall. The work is really a reclamation of land, and in due time some of these locations will be suitable for agricultural purposes. The drying of the soil and the leaching out of the salt renders the soil unfavorable for breeding of sand flies or mosquitoes, and at the same time prepares it for "fresh land" vegetation.

Screw worm situation in Georgia.--W. E. Dove, Savannah, Ga., reports that in cooperation with M. S. Yeomans, State Entomologist, R. A. Roberts recently made preliminary investigation in the areas that were affected by screw worms during the autumn of 1933. At Hinesville, Ga., near the border of the outbreak of last year, Cochliomyia americana Cushing and Patton was reared from wounds of cattle on May 27. This infestation occurs on the most northern edge of last year's outbreak, after a severe winter for this section and during the early part of the screw worm season. Those familiar with screw worms on large ranches of the West probably would not view this with alarm, but in southern Georgia many farmers are depending upon a few hogs and a milch cow or two for food, and the loss of one of them is a serious matter. Since these farmers are not experienced with screw worms, it is not surprising that the new pests cause much excitement.

Mosquito control in Alabama and Mississippi.--During the latter part of April G. H. Bradley was engaged in a survey of the effectiveness of the mosquito control work done in cooperation with the Civil Works Administration in Alabama and Mississippi. Some very effective drainage has been accomplished where projects were completed. For the most part very few mosquitoes were in evidence and very little breeding was taking place in these areas.

Buffalo gnat outbreak in Arkansas.--While in Mississippi Mr. Bradley was called to Arkansas on account of a serious outbreak of buffalo gnats (Simulium pecuarum Riley) in that State. A rather careful check of the damage done indi-

cated that 527 mules had been killed in the counties of Monroe, Phillips, Lee, Cross, and Lonoke. This killing of mules led to a great deal of publicity being given the outbreak and the gnat stories appearing in the press were indicative of the lack of exact information on this pest. In Mississippi there has been no serious gnat outbreak this year although such outbreaks have occurred in that state in former years. Mr. Bradley's studies have indicated that temperature, coupled with river conditions, has a great deal to do with gnat outbreaks. This year in Arkansas temperatures were subnormal during February and March, and the rivers were low until late in March, when a flood stage occurred which lasted until about the middle of April. Gnat pupal skins found on vegetation above water indicated that the adult gnats had emerged during the period of high water.

Survey and investigations in Panama.--F. C. Bishopp, Washington, D. C., arrived in New York City on May 28 from Panama, where he carried on some medical entomological work for a short period in cooperation with the Health Department of the Canal Zone. Special attention was given to the increased breeding of Anopheles albimanus Wied. in various parts of Gatun Lake. This mosquito is the main vector of malaria in the Zone. It is found breeding in large numbers in parts of the lake that have surface mats of aquatic plants of the genus Chara. Since Gatun Lake has more than 1,000 miles of shore line and the Chara is found in many parts of the lake the problem of destruction of the plant is a tremendous one. Some tests of chemicals made by Dr. Bishopp indicate that copper sulphate is fairly effective if used in rather concentrated form. Other chemical weed killers did not give encouraging results. Some attention was given to various other insects affecting man and livestock, including possible transmitters of the trypanosome disease of horses known as Murina. Horn flies, horse bots (Gasterophilus intestinalis DeG.), and cattle grubs (Hypoderma spp.) were found not to occur in the Zone or in adjacent Panama. Among the poultry parasites taken were specimens of an undescribed species of Lipeurus on chickens; also several lots of L. tropicalis, recently described by H. S. Peters. No specimens of the common chicken body louse (Eomenacanthus stramineus Nitz.), the fluff louse (Goniocotes hologaster Nitz.), or the common chicken head louse (L. heterographus Nitz.) were found. The latter appears to be replaced in the tropics by L. tropicalis. What appears to be the buffalo louse (Haematopinus tuberculatus Nitz & Gobel) was found infesting dairy cattle at Cristobal, Canal Zone. The switches of the tails of these cattle were heavily infested with the short-nosed ox louse (H. eurysternus Nitz.). Ticks were found to be less abundant than was anticipated. The Australian cattle tick (Boophilus annulatus australis Fuller) was present on nearly all cattle and dipping of dairy herds is practiced. The cayenne tick (Amblyomma cajennense Fab.) was somewhat annoying to man on Barro, Colorado Island, and in pasture lands in the Republic of Panama.

During his stay Dr. Bishopp was invited to attend and address a meeting of the Canal Zone Medical Society at the Gorgas Memorial Laboratory. He presented a resume of the recent CWA Pest Mosquito Control Project in the United States.

Ectoparasites presented to the Bureau.--M. A. Carriker, Jr., of the Academy of Natural Sciences of Philadelphia, Pa., spent May 28 working over the Mallophaga collection of the Division. Mr. Carriker has been collecting birds in Peru during the past 3 years and presented the Division with a number of ticks and other ectoparasites from Peruvian birds and animals. On June 9 he sailed for 8 months of collecting in Bolivia. On his return he intends to work up the Mallophaga obtained in Peru and Bolivia.

The black widow spider in Oregon.--An unusual abundance of the black widow spider (Latrodectes mactans Fab.) at Klamath Falls, Oreg., is reported by H. H. Stage, Portland. In view of the serious nature of the disturbances caused by the bite of this spider, this Division is interested in receiving reports concerning its occurrence and the degree of abundance in all parts of the country. Case histories of persons bitten by the spider are also desired.

IDENTIFICATION AND CLASSIFICATION OF INSECTS

E. A. Chapin has recently discovered among the undetermined Phyllophaga in the National Museum collections, two specimens of P. aerula Horn which greatly extend its known northern range. The species has long been known from Florida and Mississippi but was not reported from South Carolina by Luginbill. The specimens include a male taken at Breton Bay, Potomac River, Md., July 13, 1923, by H. S. Barber and R. Budlong, and a female collected at Plum Point, Md., July 4, 1912, by Wm. Palmer.

L. L. Buchanan has determined as (? Corigetus) castaneus Roelofs a weevil collected in August 1933 at Montclair, N. J., by Alan Nicolay. This insect was described from Japan in the genus Mylocerus, but Mr. Buchanan considers that it does not belong in this genus and has assigned it tentatively to Corigetus. The specimen was submitted to Mr. Buchanan by A. C. Davis, Takoma Park, Md. Apparently nothing is known regarding its habits.

Rajawong Chakratong Tongyai, of Siam, at present studying entomology at Cornell University, worked on Buprestidae with W. S. Fisher on May 18 and 19.

John Bowman, of Pittsburgh, Pa., spent May 28 and 29 conferring with coleopterists on details of his forthcoming volume on Pselaphidae of North America.

F. H. Benjamin reports the identification of a number of very interesting moths from a lot sent in by S. E. Crumb, Puyallup, Wash. Included were Euxoa wilsonii Grote, a rare species; Septis vultuosa Grote, not previously seen from the Pacific Coast of the United States; Conistra fringata B. & McD., previously known only from the unique type; Graftolitha disposita Morr., not previously in the Museum collection from any area west of Manitoba; Polia wyatti B. & Benj., another rare species; and Lasionycta arietis Grote, a species recognized only once previously since the description was published.

Alan Stone has identified a pair of Phlebotomus vexator Coq., collected on May 25, 1934, at the Civilian Conservation Corps Camp at Ansley, La., which were sent in for determination in connection with this year's CCC mosquito survey. This small blood-sucking psychodid has never been reported heretofore from any place more than 60 miles from Washington, D. C. While it belongs to a group of flies some of which transmit important diseases of man, this species usually confines its feeding to reptiles.

Three specimens of a chalcidoid, reared March 1, 1934, by H. J. MacAloney from Scolytus multistriatus Marsh, infesting elm branches at Fairfield, Conn., have been identified by A. B. Gahan as (Elachestus) Entedon leucogramma (Ratzeburg). Two additional specimens of the species are in the National Museum collection, taken at Norfolk, Va., July, 1933, from an elm log imported from France. The species is reported as a parasite of Scolytus multistriatus and S. rugulosus Ratz. in Europe, but has not previously been known to occur in America.

P. W. Oman spent the week of May 21 to 26 at the Carnegie Museum, Pittsburgh, Pa., examining types and determined specimens of species of neotropical Bythocopinae, Cicadellinae and Jassinae (Homoptera: Cicadellidae) described by Dr. Herbert Osborn in the Annals of the Carnegie Museum from 1923 to 1926. Over a thousand specimens from the collections of the National Museum and the Bureau of Entomology were taken to Pittsburgh for comparison with the determined material there. The primary purpose of the trip was the examination of types, a necessity to complete a paper dealing with the classification of South American agallian leafhoppers, but other work was completed. Detail drawings were made of types of genera not represented in collections at Washington. Every possible courtesy was received from Dr. Hugo Kahl, Curator of Insects at the Carnegie Museum.

INSECT PEST SURVEY AND INFORMATION

During the month this office took over several of the activities assigned to it when the new Division of Insect Pest Survey and Information was created on May 1.

A great many requests have been received for small exhibits, particularly those illustrating the more recently introduced insect pests. Many of these requests could easily be filled with very simple riker mounts showing the life-history stages of the insects and examples of their work. It is suggested that those in charge of investigations on these important newly introduced insects collect a large supply of material to meet this demand, preferably keeping in alcohol all insects except Lepidoptera. By making such exhibits available much educational work could be done at practically no cost, as the collection of this material could be incidental to the regular work in the field.

In response to requests from correspondents, 745 Bureau publications were sent out during the period from May 1 to June 14.

During the month (May) 13 press releases and 6 radio releases, originating in or approved by the Bureau, have been handled by this Division.

PHYSIOLOGY AND TOXICOLOGY OF INSECTS

Closer cooperation is being established between the Insecticide Division of the Bureau of Chemistry and Soils and the Takoma Park, Md., laboratory of the Bureau of Entomology. Howard A. Jones, of the Insecticide Division, has moved his laboratory to this laboratory, where he will remain until the new quarters of the Insecticide Division are ready in Washington. The work of this laboratory was inspected by several members of the Insecticide Division, namely, R. C. Roark, C. M. Smith, H. L. J. Haller, F. B. LaForge, W. O. Robinson, J. E. Fahey, J. L. Lusk, and F. Acree. It is expected that their visit will promote closer personal contacts between the men who develop insecticides and those who test them against insects. Doctor Haller and Doctor LaForge are beginning a new project on synthetic insecticides, starting with phenothiazine, which was found very promising at this laboratory. Triangular cooperation with the Bureau of Plant Industry and the Bureau of Chemistry and Soils is also to be undertaken soon. A survey will be made of the insecticidal value of specimens of the devil's shoestring (Cracca virginiana), which will be collected in different parts of the country.

BEE CULTURE

Nosema disease was very prevalent in the Somerset, Md., apiary this spring. At times literally thousands of bees were crawling all over the apiary, deserting

the hives from which they had come. With the beginning of the honey-flow the trouble seems much less evident. As a precautionary measure, an open drinking pool for bees was screened and an arrangement installed from which the bees could obtain only fresh running water. The colonies most seriously affected were those situated in the shade. Colonies that were in the bright sunlight were but little affected.

C. E. Burnside, Somerset, reports that samples of brood comb received from North Carolina indicate a prevalence of both European foulbrood and parafoulbrood in Duplin, Sampson, and Pender Counties. The State authorities are cognizant of the situation and are working in close cooperation with the beekeepers in the affected counties to eradicate particularly parafoulbrood, a brood disease of bees about which relatively little is known. Samples of parafoulbrood have also been received from Florida where, in previous years, the disease has been quite prevalent. Reports indicate that systematic requeening with good Italian stock has sufficed to keep the disease under control.

Warren Whitcomb, Jr., in charge of the Southern States Bee Culture Field Laboratory, Baton Rouge, La., reports the results of a series of tests on the longevity of adult bees fed on various liquid foods:

Food	Bees	Length of Life in days			
		Computed	Actual	Variation	Average
		Number	Number		
None	40	3.00	3	:	:
	34	1.97	2	:	:
	40	3.00	3	1.03	2.59
	40	2.00	2	:	:
	40	3.00	3	:	:
1/2 lb. sugar to 1 lb. water	39	51.79	62	:	:
	42	50.83	73	:	:
	48	48.69	63	3.37	49.83
	40	49.45	65	:	:
	45	48.42	57	:	:
1 lb. sugar to 1 lb. water.....	32	43.06	51	:	:
	33	49.00	57	:	:
	37	47.91	55	3.85	46.26
	38	46.63	58	:	:
	30	44.67	52	:	:
2 lbs. sugar to 1 lb. water	40	56.32	75	:	:
	41	56.63	71	:	:
	38	58.86	70	3.30	57.78
	40	59.62	75	:	:
	39	57.51	75	:	:

Mr. Whitcomb says, "The actual days column shows the number of days that the last bee in the cage lived. It is valueless, so far as determining the value of a food is concerned. The computed length of life is obtained by dividing the total numbers of 'bee-days'; that is, the sum of all the days that individual bees lived, by the number of bees in that particular cage. It is the best index I have found. The variation is the difference in days between the cages in a group

and the average is the average length of life of the cages in any group. There is a clear-cut difference between the 1/2 to 1 and the 2 to 1 groups, but not so marked a difference between the 1 to 1 and 1/2 to 1 groups, and no explanation has been offered of the superiority of the 1/2 to 1 syrup. The incubator is being checked at 100° F., and another test will start soon. This test was run at 90° F. and 65 percent humidity."

A. P. Sturtevant, in charge of the Intermountain States Bee Culture Field Laboratory, Laramie, Wyo., reports results of the examination of 75 samples of commercial Intermountain honey. The majority of the samples were from alfalfa, sweet clover, or mixtures of the two. Of the samples, 5.3 percent were Water White, 26.6 percent Extra White, and 53.3 percent White. The balance were darker than White. Not one sample was found to weigh less than 11.75 pounds per gallon, the minimum requirement under the U. S. grades. Eight out of the 75 samples weighed 12 pounds or more to the gallon. So far as cleanliness was concerned, 38.6 percent of the samples graded U. S. fancy, 58.6 percent graded U. S. No. 1, and the rest graded lower. The most significant feature of the study was that only 1 sample out of the 75 showed the presence of spores of Bacillus larvae White, and in this one sample the spore content was below the minimum infectious dose.

Frank E. Todd, of the Pacific States Bee Culture Field Laboratory, Davis, Calif., reports as follows: "Owing to the dearth of nectar at this time, bee-keepers in the Sacramento Valley are finding it necessary to feed their bees. The available feed at this time is in the foothills of the Sierra Nevada Mountains, where Buckeye trees (poisonous to bees) are prevalent and in bloom at this time. A survey of the situation last year indicated that buckeye poisoning took a toll of colonies in the State nearly as large as the loss from bee disease. In the Sacramento Valley the buckeye poison toll was about 5 percent of the commercial beekeepers' colonies. So serious is the problem that the State Beekeepers Association proposed the eradication of buckeye trees from the honey-producing areas, as a CCC project. As beekeepers must either feed their bees or take a loss from buckeye, they are faced with serious economic losses."

Hashime Murayama, an artist with the National Geographic Society, is making a series of action drawings of bees in color at the Somerset laboratory. These drawings are to accompany an article on bees which will appear in some future issue of the National Geographic Magazine. In view of the fact that practically no illustrations of bees in actual colors have been made, the series of illustrations will be looked forward to with great interest.

The beekeepers in the drought-stricken States are faced with a very serious situation. In most places the matter of obtaining a crop this year is already out of the question and beekeepers are confronted with the need of finding ways and means of maintaining their colonies for another year. Like other classes of farmers in drought-stricken areas, beekeepers do not have the cash with which to purchase sugar to tide over their colonies. The condition of the beekeeper is particularly aggravated, as a colony without food will starve in 2 or 3 days' time. Word has been received that the Crop Production Loan Office of the Farm Credit Administration can grant loans to beekeepers, but no information is at hand as to how generally beekeepers have availed themselves of loan privileges.

Geo. E. Marvin, of the Somerset, Md., laboratory, made counts of pollinating insects in a number of commercial orchards in the vicinity of Geneva, N. Y.,

and in the experimental orchard of the New York Experiment Station at Geneva, in connection with the PWA project of the Division of Fruit Insects. The project at the Geneva laboratory was concerned primarily with the use of light traps for controlling the codling moth. Similar pollinating counts were made at an experimental farm at Kearneysville, W. Va., where the codling-moth control measures involve the use of organic sprays.

PLANT DISEASE ERADICATION AND CONTROL

Citrus Canker Eradication

Two citrus canker infections have recently been reported from Texas. On May 11, 1934, during an inspection of an orchard east of League City, in Galveston County, our inspectors found citrus canker on two grapefruit trees. This orchard was badly frozen in February 1933 and since that time the owner had refused to allow anyone in his orchard for inspection or otherwise. However, he recently sold the property and the new owner permitted entrance and inspection. Agents of the Bureau inspected this property on May 11 and found the two infected trees that had grown up from the stumps of this "freeze-back" of February 1933. The infected trees were immediately destroyed, and bichloride solution was used on the ground, and all nearby trees were thoroughly soaked with the solution. All other citrus trees in the orchard appeared to be in fine, healthy condition, setting a fairly good crop of fruit. This outbreak of citrus canker was recurrent from an old outbreak that was showing up before the freeze. A close watch, with spraying of this orchard, will be adhered to. The following trees remain on the premises: 211 satsumas, 2-year tops, 8-year root stock; 43 grapefruit, 2-year tops, 8-year root stock; 7 round orange, 2-year tops, 8-year root stock; and 43 satsumas, 2-year old nursery-stock row.

On May 19, another infection was discovered near Algoa, Galveston County, Tex., where two Citrus trifoliata showed symptoms of the disease. The infected plants were growing near 42 other C. trifoliata plants which were not infected. However, all of the C. trifoliata, numbering 44 plants, were destroyed by the owner.

Dutch Elm Disease Eradication

In April and May the work in eradication of Dutch elm disease changed from the winter program of searching for and eradicating diseased and beetle-infested elms to one of mapping the distribution of elms over the balance of the area involved, preparatory to the beginning of the summer work. Despite the reduction in scouting, additional diseased trees have been found daily, bringing the total number of diseased trees on June 4, 1934, in New Jersey, New York, and Connecticut to 1,532. Wilting of foliage from the disease was first observed on May 19 in New Jersey. Considerable wilting was reported from Staten Island and some from Westchester County, where extremely severe defoliation by canker worms made such symptoms rather difficult to observe.

The first adults of Scolytus multistriatus Marsh observed this season in New York began to emerge on May 22. Adults of Hylurgopinus rufipes Eich., the native elm bark beetle, were first found in New York this season on May 10, before emergence from their brood tree. Pupae of Magdalis sp. were observed on the same date.

The first feeding injuries from Scolytus this spring in New Jersey were observed on May 28 and indicated that feeding began probably a week before that date. Very little feeding has been observed so far but Scolytus beetles are abundant enough to attack Graphium-affected trees promptly.

The small force on Public Works funds in New Jersey was concentrated on small areas of extremely heavy population on elms, and considerably less than a square mile of territory was worked. In Connecticut only mapping was done and about 84 square miles were completed. In New York over 133 square miles were mapped and over 28 square miles were covered by inspection work. The inspection work was performed largely in Nassau County, where the beginning of the work had been long delayed. At the end of May only four trees that were definitely Graphium-diseased were still standing. However, many of the 124 unreported suspects showed characteristic symptoms and the number of trees to be removed may be expected to increase very rapidly now.

Phony Peach Eradication

While inspecting for the phony peach disease in several of the more southwestern counties of Georgia, our agents found that the trees in practically all commercial peach orchards have been pulled up. This will certainly relieve our work very materially, because these orchards were heavily infected and many of them were semiabandoned. The majority of our agents spent the entire month of May in eradication of wild peaches in Peach, Houston, Crawford, Macon, and Spalding Counties. Although there was a great deal of rain during the month, it so happened that the men were able to work at least a part of every day in the field. Wild peach trees were removed during the month, as follows:

County	Wild trees removed	
		Number
Peach	111,833	
Crawford.....	1,736	
Houston.....	2,297	
Macon.....	340	
Spalding.....	1,721	
Total	117,927	

This type of work has been completed in Peach County for the present. During the past 6 months a total of 1,185,546 wild trees were removed in Peach County, as follows:

Federal CWA Project	1,040,025
State CWA Project	14,415
Our Agents	131,106
Total	1,185,546

There are four notable cannery dumps, located in or near the city of Fort Valley, and our men destroyed 862,000 trees on them. Cannery dumps are not common through the State of Georgia and for this reason the total number of wild trees found in Peach County could not serve as a criterion for judging conditions with

regard to such wild growth in other sections of the State. Subtracting these trees from the total, we find that 323,546 wild trees were removed from the remaining area of the county. In addition to the eradication of wild trees, the men inspected a few home orchards and removed some diseased trees from them, as follows:

County	Trees removed		
	Properties	Total	Phony
		Number	Number
Crawford	2	9	5
Houston	5	23	6
Spalding	2	60	16
Total	9	92	27

